User Manual

S Line Maritim HMI

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
This symbol together with the signal word NOTE and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

– The device is designed for use in maritime areas.
– The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
– The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

1.4 Target Group

The use of products described in this manual is oriented exclusively to:
– Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
– Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

2 Installation and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact us immediately.

2.2 Mounting the Device

DANGER
The following safety distances to a compass must be kept depending on the display size of the operating device:

	Display <= 7"	Display > 7"
Standard compass	0.75 m (29.527")	2.2 m (86.614")
Steering compass	0.45 m (17.716")	1.35 m (53.149")

NOTICE: Damage
When installing the device, leave a gap of at least 30 mm (1.181") around the device to ensure sufficient air circulation.

NOTICE: Damage
When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation. Make sure to allow sufficient heat dissipation!
Please observe the permissible temperature range specified in the technical data of the user manual when operating the device.

NOTICE: Damage
In order to ensure the degree of protection specified in the technical data, always make sure that the seal lies flat against the mounting surface and the threaded pins of the mounting brackets are tightened uniformly to a maximum torque of 1 Nm.

The device can be easily and quickly mounted from the rear of the device. A panel thickness of 1 mm to 6 mm (0.039" to 0.236") is permitted for proper mounting.

1. Insert the device in the mounting cutout from the front.

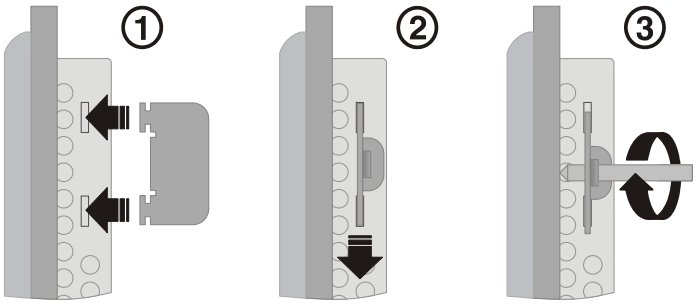


Figure 2-1 Mounting the device using a mounting bracket

2. Insert the mounting brackets into the appropriate openings (1) and pull the brackets downwards until they lock in place (2).
3. Fasten the device into position using the threaded pins (3).

2.2.1 Front Panel Dimensions

2.2.1.1 TPM070ATW / TPEM070ATW

Figure 2-2 TPM070ATW / TPEM070ATW

2.2.1.2 TPEM070AGW

Figure 2-3 TPEM070AGW

2.2.2 Mounting Cutout

2.2.2.1 TPM070ATW / TPEM070ATW

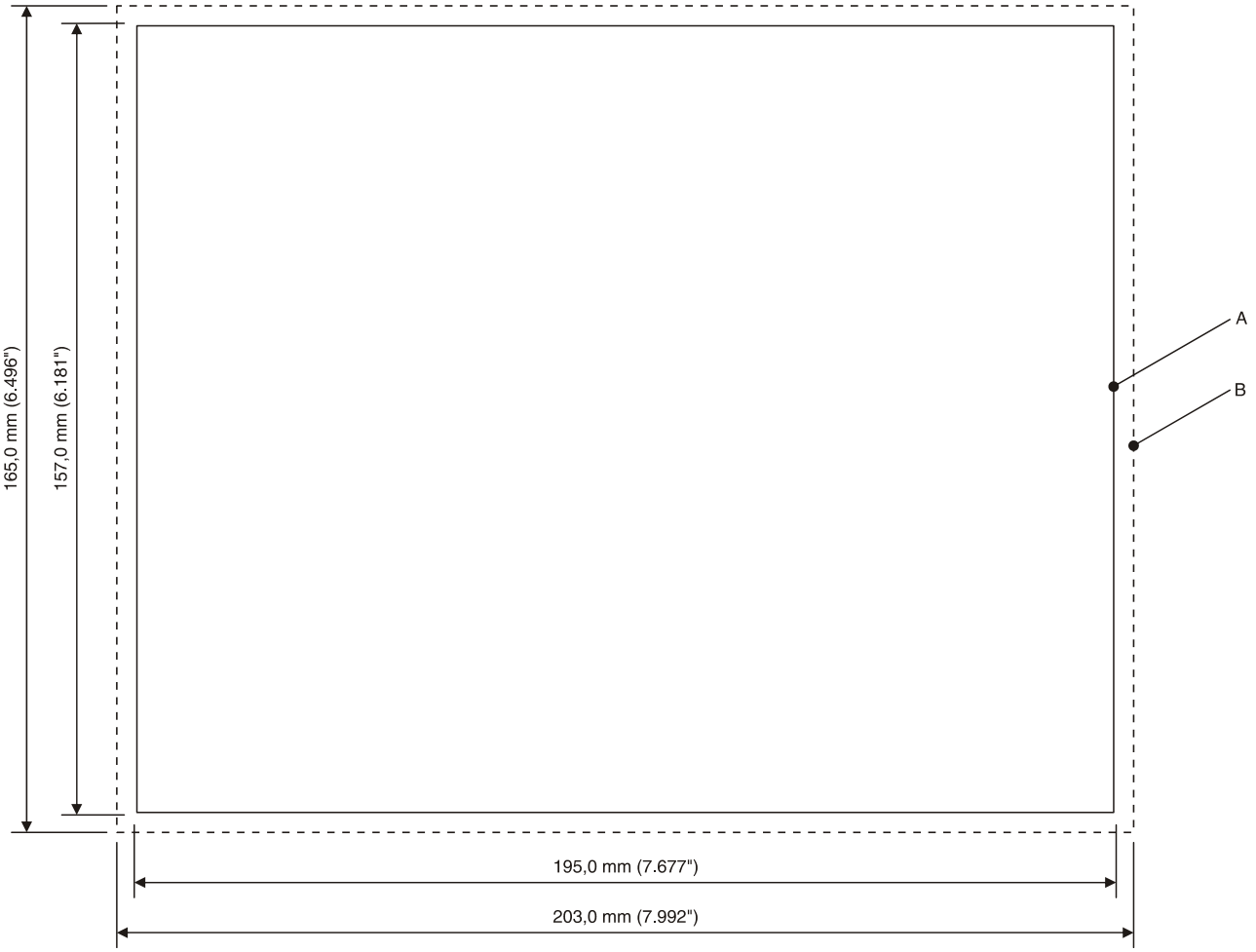


Figure 2-4 TPM070ATW / TPEM070ATW

A Mounting Cutout
B Front Panel

2.2.2.2 TPEM070AGW

Figure 2-5 TPEM070AGW

A Mounting Cutout
B Front Panel

2.2.3 Side View, Mounting Depth

2.2.3.1 TPM070ATW / TPEM070ATW / TPEM070AGW

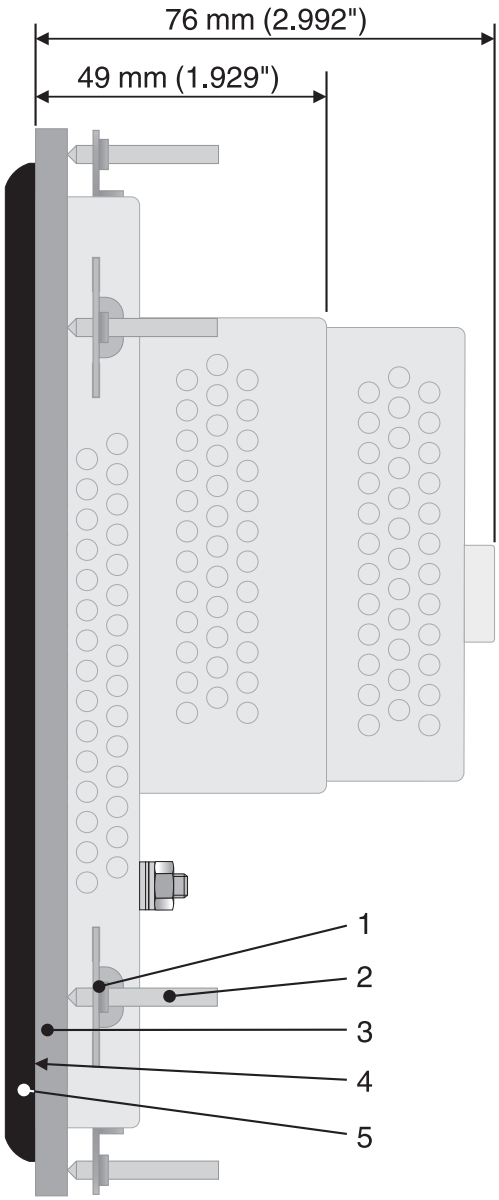


Figure 2-6 Mounting depth for the standard device / field bus device

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.3 Connecting the Device

2.3.1 Supply Voltage

The supply voltage is supplied via pin strip X1. A suitable socket strip is supplied.

Refer to the technical data for the permissible supply voltage of the operating device.

The device has reverse polarity protection. In case of wrong polarity, the device will not operate.

This is a protection class I device. For safe operation, safety extra-low voltage (SELV) in accordance with DIN EN 61131 must be used for the supply voltage.

Connector in the operating device: 3 pin pin strip

Table 2-1 Pin assignment supply voltage

Pin	Designation	Function
1	⏚	Noiseless ground / functional earth ground (FE)
2	0 V	Supply voltage 0 V (GND)
3	⎓ 24 V	Supply voltage ⎓ 24 V

DANGER: Hazardous voltages
Hazardous voltages can exist inside electrical installations that can pose a danger to humans. Coming in contact with live parts may result in electric shock!

NOTICE: Damage
Cables with finely stranded copper conductors with a minimum cross-section of 0.75 mm² (18 AWG) and a maximum cross-section of 2.5 mm² (14 AWG) must be used for the supply voltage.
You must adhere to the following torques at the connector:
Screw connection of terminal blocks: 0.22 Nm (minimal) to 0.25 Nm (maximum)
Screw flange: 0.3 Nm (maximum)

Use the following procedure to connect the device to the supply voltage:

1. Strip approx. 30 mm (1.181") off the outer cable sheath and approx. 5 mm (0.197") off the wires.

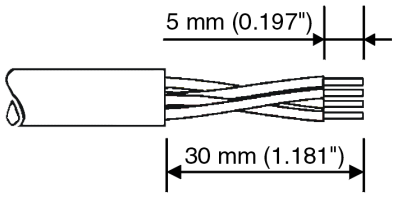


Figure 2-7 Preparing the cable

2. Fit the wires with wire end ferrules and connect the wires to the socket strip.
3. Plug the socket strip onto pin strip X1.
4. Secure the socket strip in place with a screw-type locking to prevent it from slipping out.

2.3.2 Grounding

The grounding is performed - depending on the type of device - with a slip-on sleeve (noiseless ground / functional earth ground) or a ring cable lug (protective ground).

NOTICE: Damage
A separate copper conductor must always be provided for the grounding. The conductor must have a minimum cross-section of 1.5 mm² (16 AWG) and must be kept as short as possible.
You must adhere to a maximum torque of 1 Nm at an protective grounding on the threaded bolt.

1. Strip approx. 5 mm (0.197") off the wires.
2. Fit the stripped wires - depending on the type of device - with a slip-on sleeve or a ring cable lug.
3. Plug the slip-on sleeve on the flat tab or mount the ring cable lug with the nut to the threaded bolt.

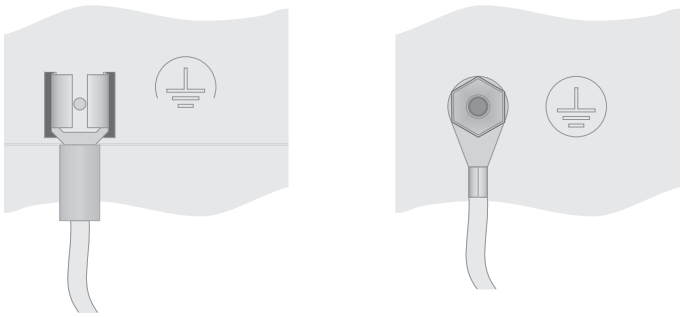


Figure 2-8 Noiseless ground / protective ground

2.4 Switching On

The Windows CE operating system is installed on the operating device. Running on the operating system is the visualization runtime.

2.4.1 Loading Procedure on Windows CE Operating System

The program allows you to use the buttons to make changes to the configuration.

The operating device has 3 operating modes:

– Normal (no button is pressed)
– Setup Main (Button **Press For Setup Main Menu** was pressed)
– Administration (**Admin** button was pressed)

2.4.1.1 Launch Structure

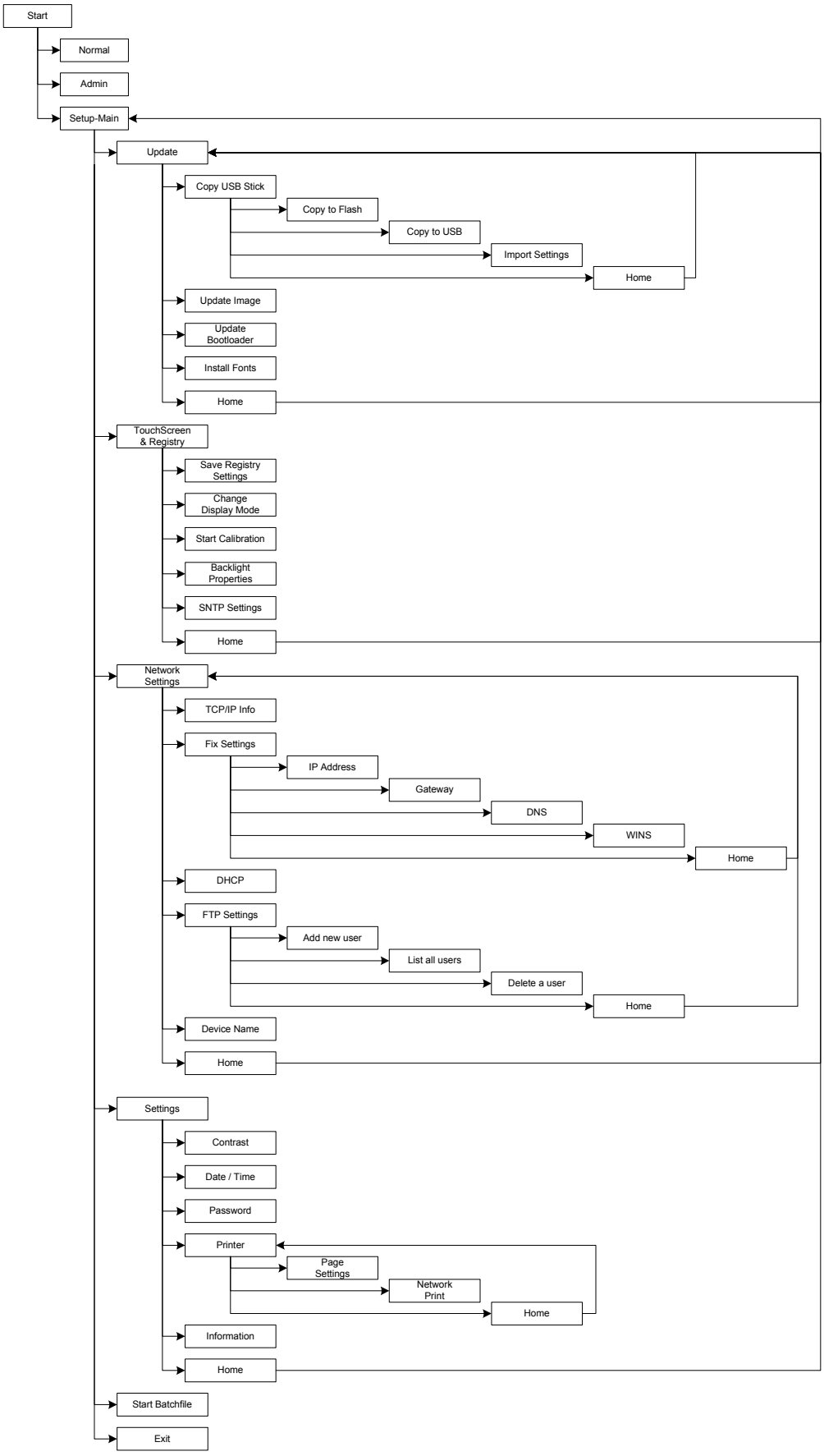


Figure 2-9 Launch structure

2.4.1.2 Normal Mode

The program AppStarter.exe starts from the internal Flash memory.

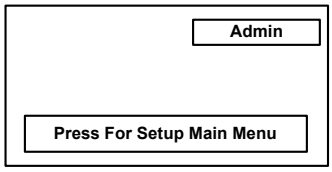


Figure 2-10 Display after startup

Please, note that the device is accessible over the Ethernet only after assignment of an IP address to the Ethernet.

2.4.1.3 Setup Main Mode

If you press the **Press For Setup Main Menu** button during the startup phase, the "Setup Main" mode starts.

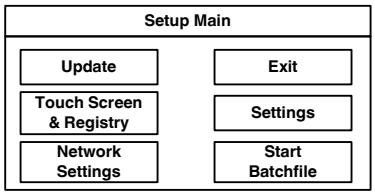


Figure 2-11 Setup Main

Some settings are password-protected. The default password is "+-+-".

Update:

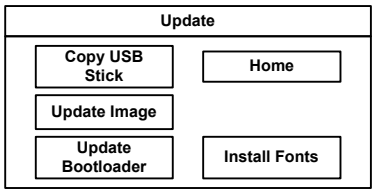


Figure 2-12 Update

Update, Copy USB Stick:

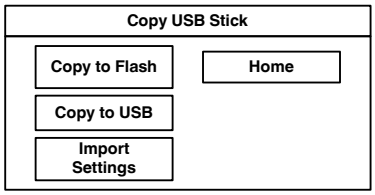


Figure 2-13 Copy USB Stick

Update, Copy USB-Stick, Copy to Flash:

This function copies the data from the USB stick to the internal flash file system.

Several projects can be managed in subdirectories below the directory TSvisRT. If more than one project is in different subdirectories, a choice dialog is displayed. Only directories which contain a project file (*.cb) are listed.

The entire TSvisRT directory or the corresponding subdirectory and the AppStarter.exe are copied into the target directory of the flash file system.

Update, Copy USB Stick, Copy to USB:

Copies the content of the flash file system to the „backup“ directory of the USB stick. This excludes protected system files. A log file is also transferred, which can be used to restore system settings via the „Import Settings“ item.

Update, Copy USB Stick, Import Settings:

An automatically generated log file can be used to restore the system settings. If the „backup“ directory of the USB stick contains a corresponding log file, these settings can be restored.
This is possible only when using identical device types.

Update, Update Image:

If the „image“ subdirectory on the USB stick contains a „*.nb0“ file, this file is used to perform the image update. There must be only one „*.nb0“ file located in this directory, otherwise the update does not start.

In this case, the flash registry is always deactivated so that the image is processed with a new default registry.

Update, Update Bootloader:

If the „bootloader“ subdirectory on the USB stick contains a „*.nb0“ file, this file is used to perform the bootloader update. There must be only one „*.nb0“ file located in this directory, otherwise the update does not start.

Update, Install Fonts:

If one or multiple fonts are in the subfolder "Fonts" of the flash memory, these will be installed at the start-up of the operating device automatically.

Depending on the number and size of fonts, the system start-up take correspondingly more time.

Touch Screen & Registry:

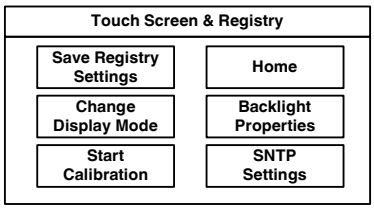


Figure 2-14 Touch Screen & Registry

Touch Screen & Registry, Save Registry Settings:

The entire registry is saved.

Touch Screen & Registry, Change Display Mode:

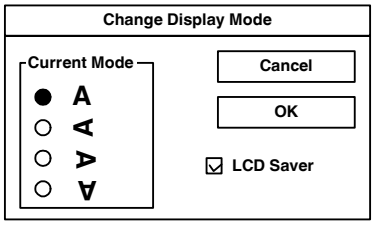


Figure 2-15 Change Display Mode

Set-up of display adjustment.

LCD Saver switches the brightness to the lowest value, if no user operation occures for at least one hour.

This entry is able to be password-protected.

Touch Screen & Registry, Start Calibration:

The touch calibration is started. After the calibration the values are stored automatically in the registry.

Touch Screen & Registry, Backlight Properties:

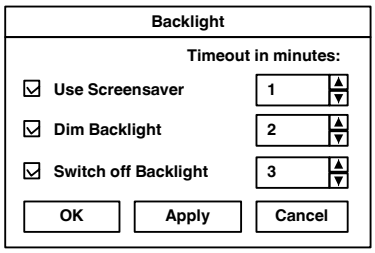


Figure 2-16 Backlight Properties

A screen saver can be activated after the defined time (minutes). It is possible to adjust the screen saver graphic by replacing the file "Screensaver.bmp" in the internal memory. The graphic is replaced at the start up of the operating device automatically when a USB stick - containing the file (Screensaver.bmp) in the "Screensaver" directory - is present.

The brightness of the backlight (dim backlight) can be reduced after the defined time (minutes) and turned off (backlight switch off) in addition.

This entry is able to be password-protected.

Touch Screen & Registry, SNTP Settings:

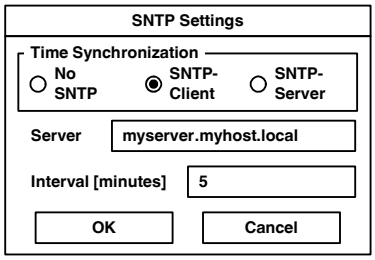


Figure 2-17 SNTP Settings

If you activate the "SNTP-Client" option, you can enter the address of a time server located in the intranet or Internet. The synchronization interval is specified in minutes.
With the option "No SNTP" the synchronization is deactivated.
The operating device may be used as a time server for other devices if the "SNTP-Server" option is active.

This entry is able to be password-protected.

Network Settings:

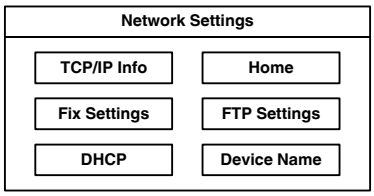


Figure 2-18 Network Settings

All addresses of the **Network Settings** have to be entered in the format "xxx.xxx.xxx.xxx".
Numbers smaller than 100 have to be filled up with leading zeros.
(e.g.: 192.168.42.1 -> 192.168.042.001)

Network Settings, TCP/IP Info:

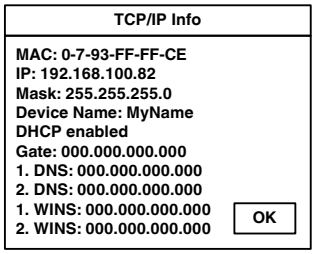


Figure 2-19 TCP/IP Info

The following informations are displayed:

- MAC address
- IP address,
- Subnet mask address,
- Device name,
- DHCP status,
- Gateway address,
- 1. DNS address,
- 2. DNS address,
- 1. WINS address,
- 2. WINS address.

Network Settings, Fix Settings, IP Address:

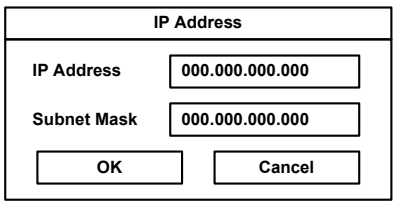


Figure 2-20 IP Address

The system automatically deselects DHCP and optionally enters the settings from the „IPSetting.ini“ file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the „IPSetting.ini“ file:

```
[IPCONFIG]
IPAddress=172.016.042.150
SubnetMask=255.255.255.000
```

Network Settings, Fix Settings, Gateway:

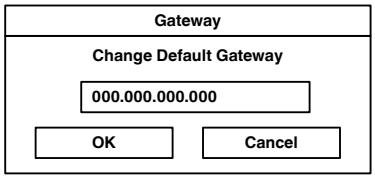


Figure 2-21 Gateway

The system automatically deselects DHCP and optionally enters the settings from the „IPSetting.ini“ file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the „IPSetting.ini“ file:

```
[IPCONFIG]
Gateway=172.016.042.150
```

Network Settings, Fix Settings, DNS:

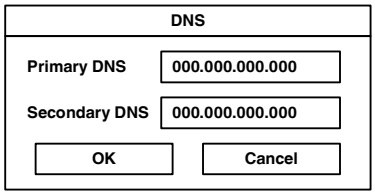


Figure 2-22 DNS

The system deselects DHCP and enters the settings from the „IPSetting.ini“ file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the „IPSetting.ini“ file:

```
[IPCONFIG]
PrimaryDNS=172.016.042.150
SecondaryDNS=172.016.042.151
```

Network Settings, Fix Settings, WINS:

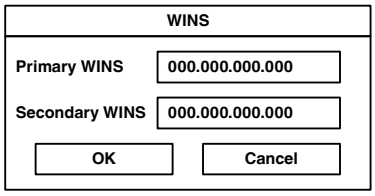


Figure 2-23 WINS

The system automatically deselects DHCP and optionally enters the settings from the „IPSetting.ini“ file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the „IPSetting.ini“ file:

```
[IPCONFIG]
PrimaryWINS=172.016.042.150
SecondaryWINS=172.016.042.151
```

Network Settings, DHCP:

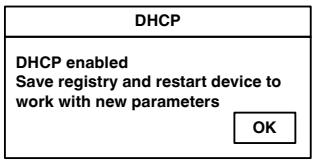


Figure 2-24 DHCP

You may enable DHCP service. You must save this setting when exiting of by using „Save Registry Settings“.

This entry is able to be password-protected.

Network Settings, FTP Settings, Add new user:

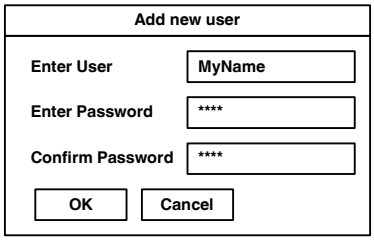


Figure 2-25 Add new user

You may enter a new user name. You have to assign a password to the user name and to confirm it.

If at least one user name is added you cannot login to the FTP server as anonymous anymore.

Network Settings, FTP Settings, List all users:

All users are listed within a DOS box.

Network Settings, FTP Settings, Delete a user:

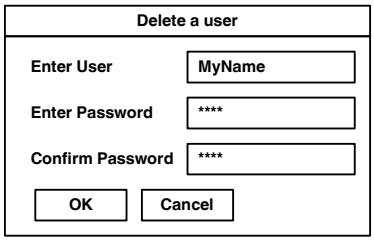


Figure 2-26 Delete a user

You may enter the user name you like to delete.

This entry is able to be password-protected.

Network Settings, Device Name:

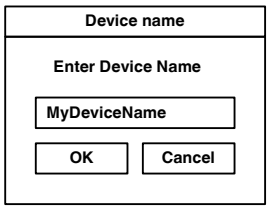


Figure 2-27 Device Name

You can define a device name with up to 14 characters. Via a FTP connection you can access the device with the device name instead of the IP address.

This entry is able to be password-protected.

Settings:

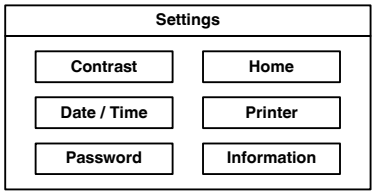


Figure 2-28 Settings

Settings, Contrast:

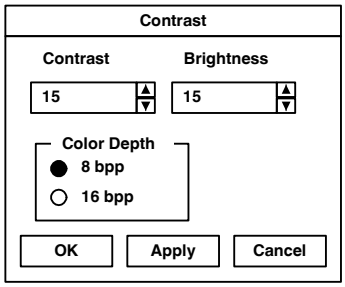


Figure 2-29 Contrast

The operating mode setup main is displayed with default values for contrast and brightness to ensure reading also at faulty values. If you change a value, you have to confirm this in a dialog. If you press **Cancel** or 5 seconds pass without any action the value is not accepted.
Depending on the display type different values can be influenced:

Display Type	Contrast	Brightness
STN (mono)	X	-
STN (color)	X	X
TFT	-	X

Selection of color depth for TFT displays.

This entry is able to be password-protected.

Settings, Date / Time:

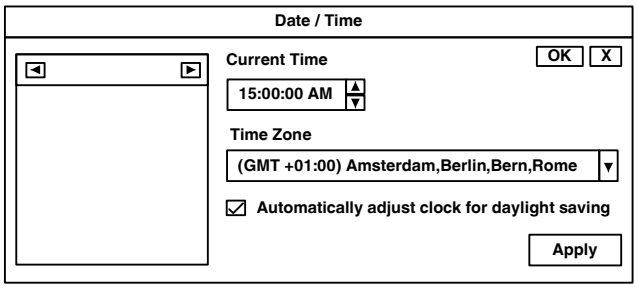


Figure 2-30 Date / Time

Set the date, time and time zone.

Settings, Password:

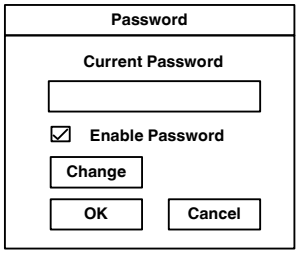


Figure 2-31 Password

The password can be activated, deactivated or redefined. When the password is activated, all password-protected dialog boxes can only be accessed if the password has been entered successfully.

This entry is able to be password-protected.

Settings, Printer:

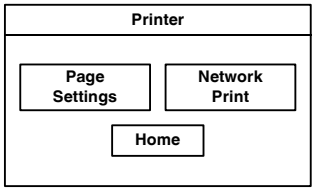


Figure 2-32 Printer

The print function depends on the application program on the operating device. Connection of a printer is possible via the network and the USB interface. The operating system supports PCL3-compatible printers.

Table 2-2 Already used printer models

Model
HP OfficeJet 6000
HP OfficeJet Pro 8000
HP DeskJet 6940
HP DeskJet 5150
HP Laserjet 1505N

This entry is able to be password-protected.

Settings, Printer, Page Settings:

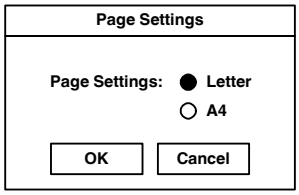


Figure 2-33 Page Settings

Select the paper format, "Letter" or "A4", "Letter" is default.

This entry is automatically stored in the registry.

Settings, Printer, Network Print:

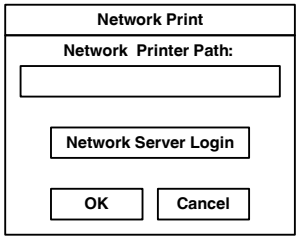


Figure 2-34 Network Print

Enter the network printer path.

This entry is automatically stored in the registry.

Settings, Printer, Network Print, Network Server Login:

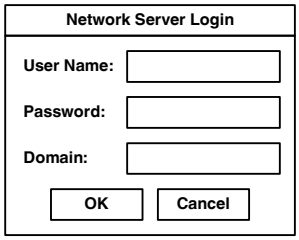


Figure 2-35 Network Server Login

You can save login data for network printing. This enables auto-login when printing without manual input at the operating device.

Enter a user name, password and domain.

This entry is automatically stored in the registry.

Settings, Information:

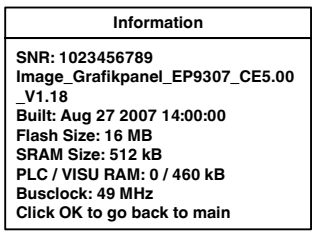


Figure 2-36 Information

The following informations are displayed:

- Serial number
- Product ID
- Image version
- Built version
- Built date
- Size of flash
- Size of SRAM
- Size of PLC / Visu RAM
- Bus clock speed

Start Batchfile:

The „project.bat“ file in the „FlashDrv“ directory starts, if available.

2.4.1.4 Administration Operating Mode

If you press the **Admin** button during the startup phase, the Administration mode of operation starts.

You can use the Admin.ini file to manage the device. This file must exist in the root directory of the USB stick.

This file is used as a dongle to prevent users from changing the device during normal operation.

Possible contents for the Admin.ini file:

Observe upper and lower case for all entries!

Explorer=Off	Deactivates the Explorer in the registry. The change becomes effective on the next device reboot.
Explorer=On	Activates the Explorer in the registry. The change becomes effective on the next device reboot.
Start=explorer.exe	Starts the explorer
Start=MyProgram.exe	Starts the application MyProgram.exe Initial directory is windows. Use the following syntax to start an application on the usb stick: Start=\\\\HardDisk\\MyProgram.exe Use multiple entries to start several applications.
Registry=Default	Destroys the current registry and activates the default registry of the image. The change becomes effective on the next device reboot.
StartRepllog=On	Enables automatic startup of the Repllog.exe program in the registry. The change becomes effective on the next device reboot.
StartRepllog=Off	Disables automatic startup of the Repllog.exe program in the registry. The change becomes effective on the next device reboot.
LaunchTouch=On	The touch variant of the launch will start at devices with keyboard. The change becomes effective on the next device reboot.
LaunchTouch=Off	The standard variant for the device will start. The change becomes effective on the next device reboot.
Lock=On	The buttons **Press for Setup Main Menu** and **Admin** are disabled. If the file „Admin.ini“ is found on the usb stick the button **Admin** is enabled. Therefore the deactivation of the lock is possible. The change becomes effective on the next device reboot.
Lock=Off	All buttons enabled. The change becomes effective on the next device reboot.
Mode=Development	The shell has full functionality. The change becomes effective on the next device reboot.

Mode=Standard	The Shell is restricted: No task bar and task switch available. Desktop contains the launch icon only. The change becomes effective on the next device reboot.
DeviceName=MyName	Defines the device name of the operating device
;DeviceName=MyName	Comment, no impact

2.5 Identification

The operating device can be identified using the nameplate on the rear of the device.

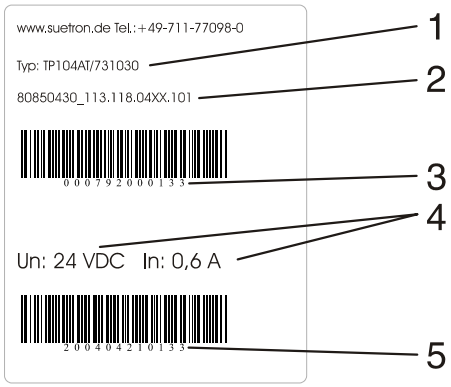
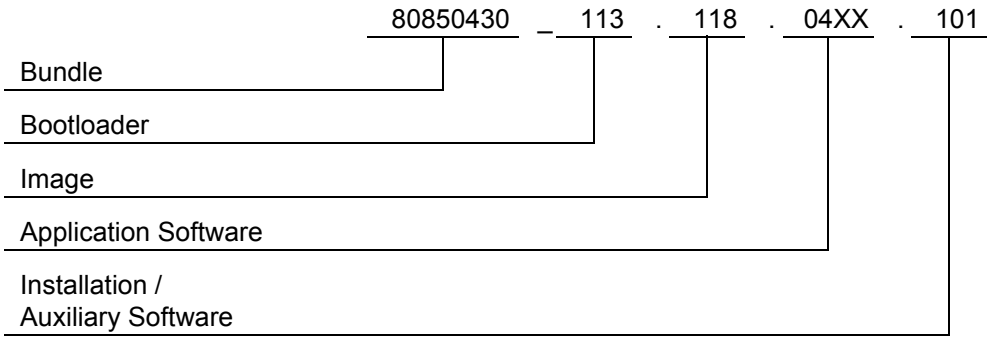


Figure 2-37 Nameplate (example)

1 Order number
2 Version key (at time of delivery)
3 MAC address
4 Voltage and power specification
5 Serial number

2.5.1 Version Key

The version key provides information on the version level of various components at time of delivery.



3 Control and Display Elements

3.1 Display

DANGER: Toxic
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

DANGER: Corrosive
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

Pixel failures, which can occur with TFT displays, are due to production and no complaint reason!

The operating device is equipped with different displays depending on variant.

3.2 Dimming

Adjust the brightness to the surrounding conditions at reached operating temperature to be able to read the display optimally.

The **Plus** key encreases the brightness of the display step-by-step. When the key is held down, the function is repeated.

The **Minus** key decreases the brightness of the display step-by-step. When the key is held down, the function is repeated at an automatically increasing rate of repetition.

The adjusted brightness level is not stored remanently.

With an upcoming alarm message the brightness level is automatically set to a higher level.

Assign the brightness level for upcoming alarm messages with the projecting software.

After all alarm messages are acknowledged the brightness is set to the preset level.

3.3 Internal Alarm Indicator

Upcoming alarm messages can be indicated audible by the internal alarm indicator. Simultaneously the relay contact for the external alarm indicator is switched.

Assign the alarm messages which should be indicated by the internal alarm indicator with the projecting software.

3.4 Touch Screen

The device is equipped with a resistive 4 wire touch screen. You operate the device using this touch screen.

NOTICE: Damage
Pointed or sharp objects, such as pens or fingernails, can lead to irreparable damages of the touch screen. Exclusively therefore use the fingertips or the aids indicated in the technical data for the operation.

NOTICE: Damage
To protect the touch screen you can use special protection foils. You receive corresponding protection foils directly from Sütron electronic.

4 Interfaces of the Device

4.1 Standard Interfaces

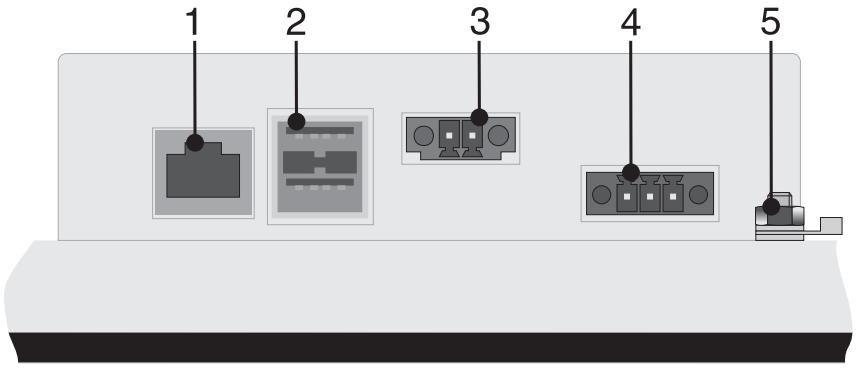


Figure 4-1 Standard interfaces

1 Female Connector X5 (Ethernet)
2 Female Connector X9, X10 (USB Host - Type A)
3 Male Connector X6 (External Alarm Indicator)
4 Connector X1 (Supply Voltage)
5 Threaded Bolt For Protective Grounding

4.1.1 Ethernet (X5)

A 10/100Base-T Ethernet interface is located at the operating device.

4.1.1.1 Pin Assignment

Connector in the operating device: RJ45 female connector.

Table 4-1 Assignment of the Ethernet interface

Pin	Designation	Function
1	Tx+	Transmitted Data, Positive Polarity
2	Tx-	Transmitted Data, Negative Polarity
3	Rx+	Received Data, Positive Polarity
4	n.c.	Not Connected
5	n.c.	Not Connected
6	Rx-	Received Data, Negative Polarity
7	n.c.	Not Connected
8	n.c.	Not Connected

4.1.1.2 Cable

NOTICE
Use a twisted pair cable of category 5 (CAT 5). The maximum cable length is 100 m (328.084 feet).

See the IEEE 802.3 standard for further information.

4.1.1.3 Diagnosis

Ethernet diagnostics LEDs are located at the operating device.

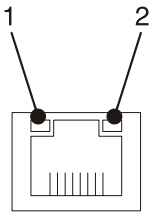


Figure 4-2 Arrangement of the ethernet diagnostics LEDs

Table 4-2 Ethernet diagnostics LEDs

No.	Color	State	Designation	Function
1	Green	On	LNK 100	Operation in mode 100 MBit/s and proper connection with 100BASE-T hub
2	Yellow	On	ACT	Sending / receiving ether-net data telegram

4.1.2 External Alarm Indicator (X6)

The operating device is equipped with a potential-free relay make contact, which is switched simultaneously with the internal alarm indicator.

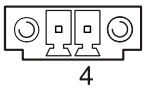


Figure 4-3 Male connector for external alarm indicator

Connect this output with an alarm indicator which is provided by a separate voltage supply.

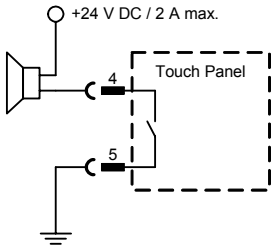


Figure 4-4 Wiring diagram for the external alarm indicator

4.1.3 USB (X9, X10)

Two host interfaces are available on the operating device.

NOTICE
Using the USB interfaces while normal operating mode is not permitted for maritime applications!
For maritime applications the use of the USB interfaces is allowed for servicing operations only!

NOTICE
Using hardware not suitable for industrial use (e.g. keyboard, mouse, memory card) may decrease safety of operation. This includes hardware intended for home and office use.

4.1.3.1 Cable

For the specification of a suitable cable, please refer to the „Universal Serial Bus Specification Rev. 1.1“.

NOTICE
The maximum cable length for the cable used is 2.5 m (8.202 feet).

4.2 Serial Interfaces

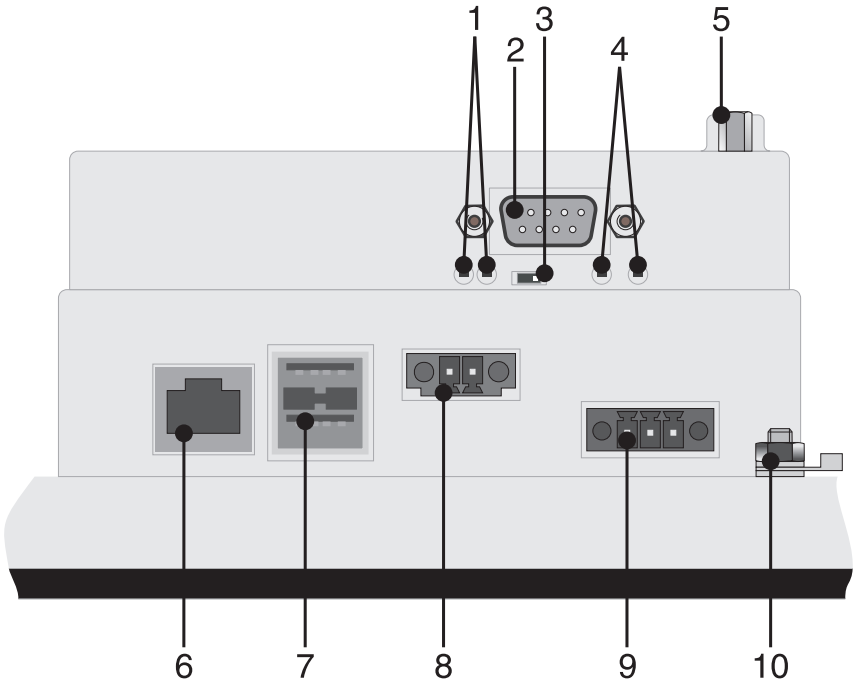


Figure 4-5 Rear view RS-422 / RS-485, RS-232

1 Diagnostics LEDs (RS-422/RS-485)
2 Male Connector X14 (RS-422/RS-485)
3 Termination Switch (RS-422/RS-485)
4 Diagnostics LEDs (RS-232)
5 Male Connector X15 (RS-232)
6 Female Connector X5 (Ethernet)
7 Female Connector X9, X10 (USB Host - Type A)
8 Male Connector X6 (External Alarm Indicator)
9 Connector X1 (Supply Voltage)
10 Threaded Bolt For Protective Grounding

4.2.1 RS-422 / RS-485 (X14)

The interface standard RS-422 / RS-485 is suitable for point-to-point and multi-point connections.

The wires belonging together are marked with „A“ and „B“. Some descriptions refer to the pins with „-“ and „+“ , where A = - and B = +.

Signal Logic 1	U_A - U_B <= -0.3 V i.e. (U_A < U_B)
Signal Logic 0	U_A - U_B >= +0.3 V i.e. (U_A > U_B)

The interface is assigned to the port COM4. At an image version before 181 and operating system Windows CE 6.0 the port COM1 is assigned.

4.2.1.1 Pin Assignment

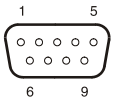


Figure 4-6 9 pin D-SUB male connector strip

Connector in the operating device: 9 pin D-SUB male connector strip.

Table 4-3 Pin assignment RS-422/RS-485

Pin	Designation	Function		
1	SGND	Signal Ground		
2	T(B)	Transmitted Data	+	P
3	T(A)	Transmitted Data	-	N
4	R(A)	Received Data	-	N
5	R(B)	Received Data	+	P
6	nc	Not Connected		
7	nc	Not Connected		
8	nc	Not Connected		
9	nc	Not Connected		

NOTICE
The D-SUB connector strips must be shielded sufficiently. See chapter “Shielding D-SUB Connectors“ on page 6-45.

4.2.1.2 Termination

Always turn on the termination in a 4-wire point-to-point connection (RS-422 / RS-485). A sender termination for the quiescent level of the receiver must exist on the remote station.

Turn on the termination only at the two ends of the lines in a 2- or 4-wire multi-point connection (RS-422 / RS-485).

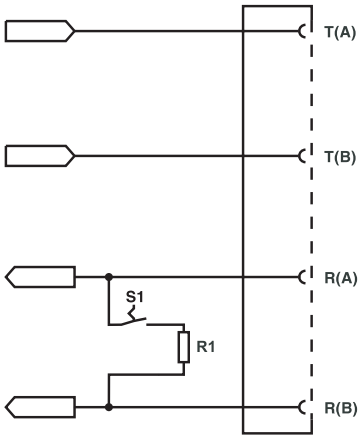


Figure 4-7 Termination possibilities RS-422 / RS-485 (intern)

Table 4-4 Resistance values termination RS-422 / RS-485

Designation	Value
R1	120 Ohm

The switch positions for ON or OFF are printed onto the operating device. Only the specified switch positions are allowed.

Table 4-5 Termination switch RS-422 / RS-485

Switch position	Function
ON	Receiver termination (120 Ohm)
OFF	No receiver termination

4.2.1.3 Transmitter Control

Switching between half-duplex and full-duplex is carried out by the DTR signal.

Full-duplex (DTR inactive / off):

The transmitter is always active and is not turned off on intermissions.
The receiver is always active.

Full-duplex (DTR active / on):

The transmitter is activated during the transmission. On intermissions, the transmitter is highly resistive.
The receiver is disabled during the transmission. The operating device does not receive the own transmit data at the receiver.

4.2.1.4 Diagnosis

Diagnostics LEDs are located on the rear of the operating device.

The diagnostic LEDs at the operating device have the following functions:

Table 4-6 Functions of the RS-422 / RS-485 diagnostics LEDs

Designation	Color	State	Function
Rx	Green	Flashes	Data transfer active
Tx	Yellow	Flashes	Data transfer active

4.2.2 RS232 (X15)

The serial RS-232 interface is suitable to establish a point-to-point connection.

The interface is assigned to the port COM3. At an image version before 181 and operating system Windows CE 6.0 the port COM0 is assigned.

4.2.2.1 Pin Assignment

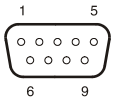


Figure 4-8 9 pin D-SUB male connector strip

Connector in the operating device: 9 pin D-SUB male connector strip.

Table 4-7 Pin assignment RS-232

Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	nc	Not Connected
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

NOTICE
The D-SUB connector strips must be shielded sufficiently. See chapter “Shielding D-SUB Connectors“ on page 6-45.

4.2.2.2 Diagnosis

Diagnostics LEDs are located on the rear of the operating device.

The diagnostic LEDs at the operating device have the following functions:

Table 4-8 Functions of the RS-232 diagnostics LEDs

Designation	Color	State	Function
RD	Green	Flashes	Data transfer active
TD	Yellow	Flashes	Data transfer active

4.3 Field Bus Interfaces

4.3.1 CAN (X12, X13)

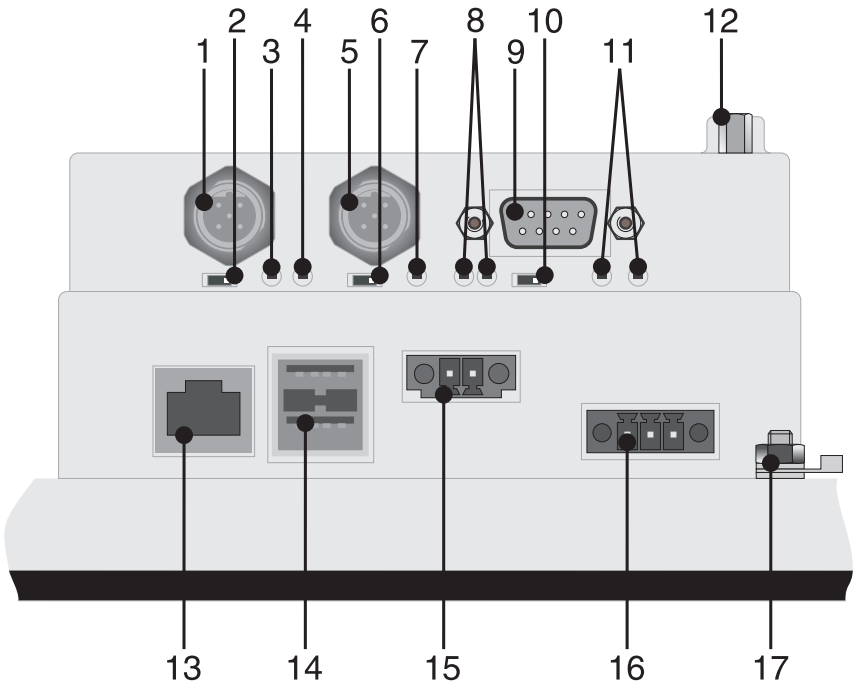


Figure 4-9 Rear view CAN

1 Male Connector X12 (CAN1)
2 Termination Switch (CAN1)
3 Diagnostics LEDs (CAN1)
4 Diagnostics LEDs (Microcontroller)
5 Male Connector X13 (CAN2)
6 Termination Switch (CAN2)
7 Diagnostics LEDs (CAN2)
8 Diagnostics LEDs (RS-422/RS-485)
9 Male Connector X14 (RS-422/RS-485)
10 Termination Switch (RS-422/RS-485)
11 Diagnostics LEDs (RS-232)
12 Male Connector X15 (RS-232)
13 Female Connector X5 (Ethernet)
14 Female Connector X9, X10 (USB Host - Type A)
15 Male Connector X6 (External Alarm Indicator)
16 Connector X1 (Supply Voltage)
17 Threaded Bolt For Protective Grounding

4.3.1.1 Pin Assignment

Figure 4-10 5 pin M12 male connector

Connector in the operating device: 5 pin M12 male connector.

Table 4-9 Pin assignment CAN 1

Pin	Designation	Function
1	PE	Shielding
2	Reserved	Reserved for DeviceNet
3	CAN1_GND	CAN Ground
4	CAN1_H	CAN_H Bus Line
5	CAN1_L	CAN_L Bus Line

Table 4-10 Pin assignment CAN 2

Pin	Designation	Function
1	PE	Shielding
2	Reserved	Reserved for DeviceNet
3	CAN2_GND	CAN Ground
4	CAN2_H	CAN_H Bus Line
5	CAN2_L	CAN_L Bus Line

NOTICE
The M12 connectors must be connected to the cable shield.

4.3.1.2 Cable

NOTICE
A shielded twisted-pair cable complying with ISO 11898-2 must be used.

A suitable cable with the designation „SAC-5P- 2,0-920/FS SCO“ is offerd by Phoenix Contact GmbH with article number 1518216.

The maximum cable length depends on the data transfer rate used.

Table 4-11 Bit rate CAN

Bit rate	Cable length
125 kBit/s	500 m
500 kBit/s	100 m
1 MBit/s	40 m

4.3.1.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

The switch positions for ON or OFF are printed onto the operating device. Only the specified switch positions are allowed.

Table 4-12 Termination switch CAN

Switch position	Function
ON	Termination (120 Ohm)
OFF	No termination

4.3.1.4 Diagnosis

Diagnostics LEDs are located on the rear of the operating device. The LEDs show the states of the bus system.

The diagnostics LEDs at the operating device have the following functions:

Table 4-13 Functions of the CAN diagnostics LEDs

Designation	Color	State	Function
CAN1	Green	On	Node is operational
	Green	Flashes	Node is not operational
CAN2	Green	Ein	Node is operational
	Green	Flashes	Node is not operational
µC	Green	Off	Microcontroller inactive
	Green	Flashes slowly	Microcontroller is operational
	Green	Flashes slowly and fast	Microcontroller is operational Requests of the host CPU are received and processed

4.4 Shielding D-SUB Connectors

You must shield D-SUB connectors as follows:

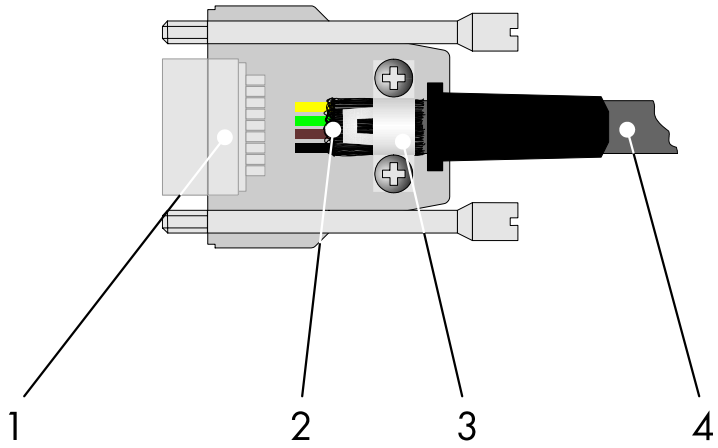


Figure 4-11 Shielding D-SUB connectors

1 D-SUB connector
2 Shield
3 Cable clip
4 Cable

The shield must be folded back into a flat position over the cable sheath.

When fastening the cable with the cable clip, as much of the shielding as possible must be in contact with the housing and sufficient strain relieve must be ensured.

5 Maintenance and Servicing

5.1 Maintenance Interval

The following maintenance intervals are recommended for this operating device:

Table 5-1 Maintenance interval

Maintenance work	Interval
Changing the Battery	4 Years

5.2 Front Panel

Only use a damp cloth to remove any dirt from the front panel.

5.3 Fuse

NOTICE: Damage
The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.4 Battery (Option)

The built-in battery supplies the real-time clock. The minimum battery life is 5 years, even under unfavorable operating conditions.

We recommend to change the battery approximately every 4 years as part of the regular maintenance work. A prepared battery including connector can be obtained directly from Sütron electronic.

5.4.1 Changing the Battery

CAUTION: Explosive
Do not throw lithium batteries into fire, do not heat to 100 °C or higher and do not recharge.

CAUTION: Toxic
Do not open lithium batteries.

NOTICE: Damage
Batteries must only be changed by authorized and trained experts!

NOTICE: Damage
For changing the battery you may only use replacement batteries of Sütron electronic.

NOTICE: Damage
Electrostatic discharge can damage electronic components. Observe the ESD protective measures!

To ensure that the data in the SRAM and the time are preserved, it is possible to change the battery under operating voltage. Observe the corresponding safety notices!

1. Remove the screws on the rear of the device and lift off the enclosure cover.
2. Remove the glue strip securing the battery.
3. Disconnect the connector from the battery and remove the dead battery.
4. Plug in the cable for the new battery.
5. Use a glue strip to attach the new battery to the enclosure.
6. Place the enclosure cover back onto the device.
7. Carefully tighten the screws of the enclosure cover.

5.4.2 Battery Disposal

The manufacturer is obliged to mark batteries with this symbol before first placing into market. The symbol is extended by the chemical symbols if the following limiting values are exceeded:

More than 0.0005 mass percent mercury	Hg
More than 0.002 mass percent cadmium	Cd
More than 0.004 mass percent lead	Pb

Batteries can be given back free of charge after use at the place of purchase.

According to the §11 of the battery law, final consumers are obligedly to give old batteries back to gathering points which attached to the common take back system or manufacturer-specific take back systems.

NOTICE: Damage
To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

6 Technical Data

6.1 General

Ethernet	
X5 Ethernet	10/100Base-T

External Alarm Indicator	
Potential-free relay make contact	
X6	Maximum switching voltage: 24 V DC Maximum switching current: 2 A DC

USB	
Corresponds to the "Universal serial bus specification Rev. 1.1“	
X9, X10 Host	Min.: 1.5 Mbit/s Max.: 12 Mbit/s Max. output current 100 mA per output

Field Bus Interfaces	
Variable baud rates and data formats	
X12 / X13 CAN	In accordance with ISO 11898 Galvanically Isolated

Serial Interfaces	
Variable baud rates and data formats	
X14 RS-422 / RS-485	In accordance with DIN 66259-4 Transmission length: 0 - 1200 m, twisted pair wire, shielded, galvanically isolated
X15 RS-232	In accordance with DIN 66259 T1, CCITT V.28 Transmission length: 0 - 15 m, conductors layered in strands, shielded, galvanically isolated

Memory	
Flash	64 MByte
SDRAM	128 MByte
SRAM	512 KByte

Connection System
D-SUB Female and Male Connector Strips, 9 Pin
Female and Male Connector Strips, Phoenix MINI COMBICON, 2 and 3 Pin
RJ45 female connector
USB female connector A

Standards and Guidelines	
Interference immunity	DIN EN 61000-4-2 DIN EN 61000-4-3 DIN EN 61000-4-4 DIN EN 61000-4-5 DIN EN 61000-4-6 DIN EN 61000-6-2
Emitted interference	DIN EN 55011 limit value class A DIN EN 55022 limit value class A DIN EN 61000-6-4
Equipment requirements	DIN EN 61131-2
Storage and transportation	DIN EN 61131-2
Power supply	DIN EN 61131-2
Electromagnetic compatibility	2004/108/EG
Degrees of protection	DIN EN 60529
Impact load, shocks	DIN EN 60068-2-27
Sinusoidal vibrations	DIN EN 60068-2-6

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate counter-measures, and to bear the cost of same.

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.2 TPM070ATW

Central Processing Unit	
Central processing unit	RISC ARM9
Clock frequency	200 MHz
Other features	Watchdog timer, real-time clock, battery monitoring

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	130° / 140°
Backlight	TFT
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.5 A
Power consumption (maximum)	0.7 A
Connected load	12 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	165 x 203 x 5 (6.496 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	157 x 195 (6.181 x 7.677)
Mounting depth in mm (Inch) - (standard / field bus)	49 (1.929) / 76 (2.992)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

6.3 TPEM070ATW

Central Processing Unit	
Central processing unit	RISC ARM9
Clock frequency	184 MHz
Other features	Watchdog timer

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	130° / 140°
Backlight	TFT
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	- 10 °C to + 70 °C (14 °F to 158 °F)
Temperature during storage, transport	- 30 °C to + 80 °C (- 22 °F to 176 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Operating altitude (abovesea level)	0 m to 4000 m
Application area	Degree of pollution 2, overvoltage category III

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.5 A
Power consumption (maximum)	0.7 A
Connected load	12 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	165 x 203 x 5 (6.496 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	157 x 195 (6.181 x 7.677)
Mounting depth in mm (Inch) - (standard / field bus)	49 (1.929) / 76 (2.992)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

6.4 TPEM070AGW

Central Processing Unit	
Central processing unit	RISC ARM9
Clock frequency	184 MHz
Other features	Watchdog timer

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	130° / 140°
Backlight	TFT
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	- 20 °C to + 70 °C (- 4 °F to + 158 °F)
Temperature during storage, transport	- 30 °C to + 80 °C (- 22 °F to + 176 °F)

Environmental Conditions	
Relative air humidity for operation and storage	Front: 5 % to 95 % Rear: 20 % to 85 %, no condensation
Operating altitude (above sea level)	0 m to 4000 m
Application area	Degree of pollution 2, overvoltage category III

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.5 A
Power consumption (maximum)	0.7 A
Connected load	12 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	173 x 211 x 5 (6.811 x 8.307 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	165 x 203 (6.496 x 7.992)
Mounting depth in mm (Inch) - (standard / field bus)	49 (1.929) / 76 (2.992)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

7 Ordering Data

Table 7-1 Accessories

Description	Part No.
USB 2.0 stick 2 GB	81152.200
USB 2.0 stick 8 GB	81152.800
Battery, assembled with cable and connector (Type: CR2450)	66779.000
Protective foil for touch screen 3.5" (Set with 10 protective foils, scraper and instructions))	81251.035
Protective foil for touch screen 3.8" (Set with 10 protective foils, scraper and instructions)	81251.038
Protective foil for touch screen 4.3" (Set with 10 protective foils, scraper and instructions)	81251.043
Protective foil for touch screen 5.7" (Set with 10 protective foils, scraper and instructions)	81251.058
Protective foil for touch screen 7" (Set with 10 protective foils, scraper and instructions)	81251.070
Protective foil for touch screen 9" (Set with 10 protective foils, scraper and instructions)	81251.090
Protective foil for touch screen 10.5" (Set with 10 protective foils, scraper and instructions)	81251.104
Protective foil for touch screen 12" (Set with 10 protective foils, scraper and instructions)	81251.120
Protective foil for touch screen 15" (Set with 10 protective foils, scraper and instructions)	81251.150

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